

solplan review

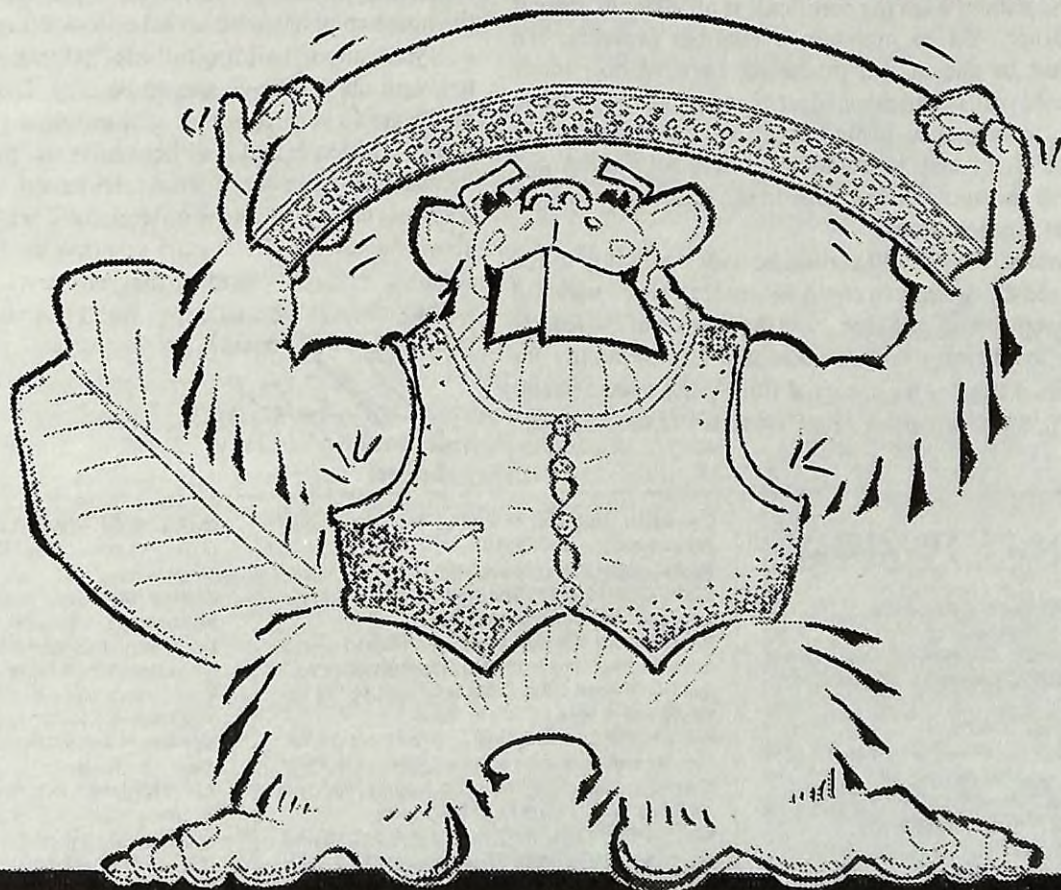
the independent journal of energy conservation, building science & construction practice

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Stressed Skin Panels



From the Editor . . .

I hear many builders claim that they don't need to bother with R-2000 certification because the code requirements are almost already there. Besides, they say, they build better than the code, so are already building energy efficient houses. In addition, the paperwork for R-2000 is just a big bother for little benefit.

The perception that the paperwork is onerous and unnecessary may be discouraging some builders from certifying their houses, even if they really do meet the standard. But remember that a record of what was done and how it was done is important to be able to prove it. That is the only reason for the paperwork, and attempts are being made to streamline it. The R-2000 certificate gives the customer the assurance that the house does meet that standard. It shows that the builder made the effort to prove he delivered on the performance and quality he claimed.

I have recently encountered several instances where homeowners who believed they had an R-2000 home were disappointed when told their ten or fifteen-year-old home was not R-2000. Although there may have been a record of the house in the central registry, it was not a certified house because the builder failed to complete the quality assurance procedures to receive the certificate.

Another argument made against certifying a house is that too few people understand what the certificate is all about to make it worth the bother. Yet to maintain a credible presence, the certificate must be shown and promoted. Look at how many products are sold with certificates. Most of us may not understand the meaning or substance behind the certificate, yet we are comforted that there may be something more substantial and better quality if the supplier has gone to the effort to produce a certificate that implies quality.

For new homes, the R-2000 certificate adds credibility to the product you produce. It shows a commitment to the high standard the certificate represents, and that it has the support of the federal government. Government endorsement still has credibility for many people as it implies an impartial third-party endorsement. The third party certificate proves how much better the house is.

Through certified R-2000 homes, builders can show their commitment not only to higher quality construction but also to the environment. The energy and resource efficient construction at the core of the standard is a measurable yardstick for that improvement.

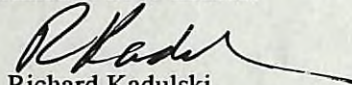
I challenge all those builders who say they already build to the R-2000 standard to prove it. Here is how you can do it. Get an Energuide for Houses evaluation done on your last (or presently about to be finished) house.

The Energuide for Houses program is a labelling program for existing houses (not unlike the appliance evaluation we are familiar with). The process includes a site evaluation using a version of HOT2000 and a blower door to measure the airtightness of the house. All homes receive a rating on a scale from 0 to 100. An older, poorly insulated house may receive a rating of 50 or less, a typical new house may be 66 to 75, while a new R-2000 house should score 80 or more.

I suggest you test the home you believe is already at the R-2000 level of performance. If the house meets the R-2000 airtightness criteria and the energy budget (the Energuide evaluator can tell you this), then talk to your regional R-2000 program manager about certifying the house. It will still require an R-2000 final inspection, including a ventilation system check, to ensure that the house complies with all other R-2000 requirements.

If you really are building to the R-2000 standard, then being able to obtain the certificate should be easy. Delivering the R-2000 certificate to your customer will enhance your credibility as a quality builder. It will also help raise the profile for R-2000 by increasing the number of certificates issued. On the other hand, if the house does not meet the criteria, the Energuide evaluation will show you how far off the mark you may be. It will suggest where improvements can be made so that your next house can be certified.

Any takers to the challenge? Will I hear about the many newly certified R-2000 houses?


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solplan review

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ISSN: 0828-6574
Date of Issue: August 2001
SOLPLAN REVIEW is published 6 times per year by: the drawing-room graphic services ltd.
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Canadian Publications Mail Product Sales Agreement No. 40013363
Postage paid in Vancouver, BC.
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Stressed Skin Panels

Stressed skin panels, also known as structural insulated panels (or SIP) systems, are a material- and labour-saving alternative to traditional stick framing. The insulation within the panels is not interrupted by framing, so provides a thermally efficient envelope. Structural insulated panels have been used for more than 30 years, and offer an energy efficient building system that is simple to build and thus reduces on-site labour time.

The use of stressed skin panels was popularized with the revival of timber framing - as infill panels between the timbers.

Stressed-skin panels can be used in walls (including foundation walls), floors, and roofs - either independently or in combination. SIPs can also be used with conventional framing. For instance, using roof and floor trusses with stressed-skin panel walls. The greatest savings in time, energy use, and materials, are achieved when panels are used for the entire house.

Stressed-skin panels offer excellent structural performance. Because they are sheathed on both faces and the sheathing is fully adhered across their entire surfaces, they behave as an integral system and resist wind forces and building dead and live loads better than conventional stick framing does.

A stressed-skin panel is a manufactured "sandwich" assembly with a rigid insulating core whose exterior and interior surfaces are bonded into panels. The most common type of panel has an expanded polystyrene foam core, faced with oriented strand board (OSB). The core may also be isocyanurate or urethane foam. Isocyanurate and urethane insulated panels are made by injecting liquid foam in place between two skins, a process that requires presses and control of both temperature and chemical mix.

The high initial R-value per inch of urethane claimed by manufacturers may decline slightly over time, unlike the R-value per inch of EPS, which remains constant. However, the urethane systems maintain an R-value of about six per inch thickness, compared with EPS at four per inch. Waferboard, plywood, sheet metal, and drywall are also used.

The skins distribute and carry the structural loading while the bonded foam core provides insulation and keeps the two skins aligned. Since there

are fewer framing members, there is little thermal bridging and the R-value remains higher.

Stressed-skin panels are typically manufactured in four feet by eight feet sizes, although some manufacturers can produce panels up to 8 x 40 ft. They are available in a variety of thicknesses, roughly corresponding to conventional framed sections. Wall panels are typically placed on a single bottom plate and have a single top plate.

Panels can be joined in several ways, depending on the manufacturer. Generally, connection details involve a tongue and groove joint with splines. Adding an expanding foam sealant at joints as recommended by the manufacturer will provide a tight air seal.

Panel products differ from one another in several ways, including water vapour permeability, foam and panel strength, temperature sensitivity, combustibility, and others. These may affect the appropriateness of a specific product for a given application.

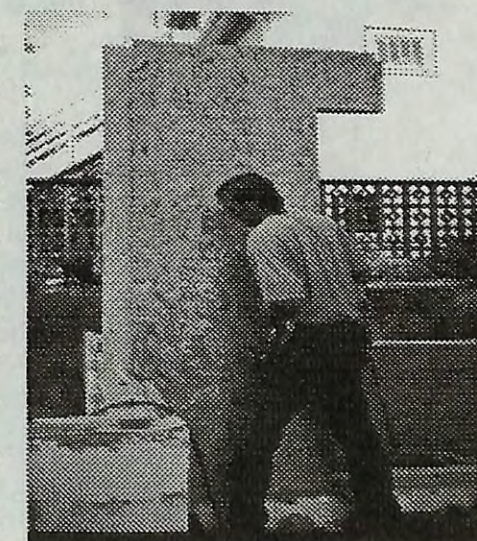
Stressed-skin panels go up quickly and give a weather tight shell early in the construction process. Because they incorporate both the structural frame and thermal insulation in a single step, supervision and co-ordination of trades are simplified.

Some panel suppliers offer full design and engineering services. Some can custom design panels by pre-cutting rough openings, edges, angles, and other complex shapes. These are then delivered on the site pre-cut and ready for installation.

Structural insulated panels are resource-efficient as they use less wood than conventional framing.



Stressed skin panels were used for the roof assembly of the BC Advanced House in Surrey, BC (1993)



Stressed skin panels used for an addition to an older North Vancouver, BC home.

The sheathings provide an efficient use of wood fibre while the foam core material has high insulation values. Although the foam core comes from a non-renewable resource, it is an efficient use of this resource. One quart of an oil-refining by-product is expanded to create forty quarts of EPS foam.

An average SIP wall section contains about 25% less wood than a similar wall framed with 2x4s at 16" on-centre. Panels can structurally cover large spans, requiring very little supplemental framing (such as sill plates and top plates).

Despite the higher material costs, the stressed-skin panel house can result in net envelope cost savings. A SIP demonstration house was built at the University of Oregon. They calculated that using SIPs they saved 2,720 board feet of wood, or nearly 50% of the framing lumber for conventional construction, and the house required 161 fewer man-hours to build.

Energy Efficiency

Stressed-skin panel homes are very energy-efficient. When panels are used throughout, the whole building envelope is insulated. The insulation is virtually continuous and panels allow little air leakage, so a stressed-skin panel house is generally easier to make airtight than a conventional stick frame house.

A house built with SIPs could produce heating energy savings of 12% - 17% compared to a stud-frame house of equal size and R-value. This is largely due to the more efficient

insulation approach that eliminates any potential for thermosiphoning or wind washing which can be a problem with improperly installed batt insulation.

The panels themselves provide the required air and vapour barrier. However, to ensure a continuous air barrier, the joints at the panel to floor, panel to panel, panel to roof, and at penetrations must be sealed with long life sealants. It is important to be aware that some adhesives and caulks are incompatible with foam insulation, so care must be taken when selecting sealants.

Design & Engineering

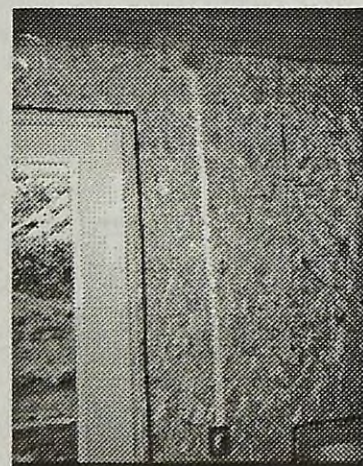
Stressed-skin panels offer design flexibility. For example, if they replace conventional roof trusses, they can accommodate a living area under the pitched roof or where it would otherwise be necessary to use very large rafters. The BC Advanced House is one example of this. The roof structure encloses a large volume while creating interesting living spaces.

Limitations

Because the panels do not have open cavities, they require different approaches to plumbing and electrical systems than conventional framing. Ideally, a designer should incorporate as much of the plumbing and electrical work as possible on interior (non-panel) walls. Where that is not possible, walls can be furred out for plumbing vent stacks and electrical runs.

Stressed Skin Panel Fundamentals

- Simple, straightforward assembly, entailing less skilled labour
- Straight, smooth, plumb walls
- Eliminate the need for headers over small openings
- Provide the ability to nail anywhere - inside or out
- Less scrap and waste, creating a cleaner job site with fewer work-related injuries and lower disposal costs.
- Because they are manufactured, they lessen vulnerability to unfavourable weather and other job-site hazards, reducing delays and often producing significant savings in other carrying costs.
- Require alternate approaches to plumbing and electrical service installation
- Require use of professionals to design structure
- Larger panels require machinery for handling



Wiring in a stressed skin panel, fed from structure above. Chase re-filled with foam prior to interior finishing. The OSB forms the air barrier as well as serving as the vapour barrier.

Pre-cut electrical chases are standard in some systems, but must be specially requested in others. Often, wiring on outside walls is fed from the top or bottom, so a single saw cut is made to insert the wiring, and then refilled with foam, but each manufacturer will supply information on these kinds of details.

Most stressed-skin panels require ½" interior gypsum drywall.

Building officials, while not necessarily familiar with stressed-skin panels, have generally been receptive to their use, but will likely ask for a professional engineer to verify the structural performance. Suppliers may provide this.

Larger stressed-skin panels, often used in a floor and roofs, can be so heavy that they require cranes or other machinery for handling.

If stressed-skin panels become wet, they take a long time to dry out and may harbour mould growth. MDI resin offers greater water resistance than phenolic resins in OSB skins.

Carpenter ants have been found to nest in stressed-skin panels, as they do in conventional framing. Measures for protection against termites and rodents are the same as they are for conventional construction. Some manufacturers have developed relatively nontoxic borate foam treatments that seem effective at preventing infestations.

Environmental & Performance Factors

There are tradeoffs for each type of stressed-skin panel. None of these products is without environmental impact. Overall, stressed-skin panels are a resource-efficient building technology with significant energy-efficiency and forest-conservation benefits, and hold distinct advantages over stick framing.

The allowable roof or floor panel span will depend on the type of foam used in the core. Each manufacturer will provide that design information. Thicker panels reduce long-term deflection or deformation due to creep.

Managing Storm Water

Sediment washed into streams has a very damaging impact on all forms of aquatic life. Fisheries regulations to protect fish-bearing streams have been in effect for many years, but often have not been enforced. However, even in the absence of active enforcement, any one damaging the environment could be held liable for his or her actions.

Municipalities are beginning to take action through a more aggressive effort to clean up the environment. Further enforcement pressures can be expected from environmental groups as a means to pressure restoration of fish habitats.

Construction and parking lots are major contributors of contaminants and sediment into rivers through storm sewers. If your local municipal authorities are not checking for sediment management, they may be putting themselves at risk for not carrying out their duties.

One interesting approach to sediment management that seems to be quite inexpensive is the SILTSACK® Catch Basin Insert. It offers builders the chance to reduce their liability.

This is a fabric filter catch basin insert that captures sediment and absorbs oil while reducing silt and oil entering the storm drain system. Under normal conditions, an insert can be used for 3 to 6 months. When the unit has collected about 6 inches of sediment, it is cleaned out or replaced.

The Vancouver area distributor offers a package service for builders. It includes a sediment management plan that contains a design of a sediment management pond, a geo-fabric and barrier weir to simplify sediment removal, supply and installation of the catch basin insert in the roadway down slope from the sediment management pond, and regular inspection and maintenance of the catch basin insert.

*The Siltsack is distributed in BC by Fluids Inc.
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How much are you paying for energy?

In the last issue of Solplan Review we did a calculation of energy cost for a typical home in five cities across the country. The message we tried to get across was the order of magnitude of energy prices after this year's price increases. We also wanted to emphasize that there is still a significant difference between standard construction practices and R-2000.

Based on the comments I received, I evidently goofed on the prices I used for the calculations. The way pricing is posted got me confused! I took the posted rates off the Internet, but evidently misread the tables. In the new deregulated energy markets, such as Ontario and Alberta, market ideology has triumphed over common sense. The consumer is no longer given a net price for the energy, but a menu of prices which confuses the issue.

What the rate cards do not make clear is that all priced components must be added because they are part of the bill that will be charged. What has been forgotten is that end users are more concerned about how much they have to pay, and not about what proportion of the bill is accounted for by which part of the production chain, especially since consumers have no opportunity to choose which elements they pay - it all has to be paid.

	Construction standard	Design Heat Loss (BTU/hr)	Electrical energy cost	Natural Gas cost
Halifax	Standard code construction	51,486	\$ 3,701	
	R-2000 home	36,700	\$ 1,889	
Ottawa	Standard code construction	63,221	\$ 3,179	\$ 1,897
	R-2000 home	46,900	\$ 1,771	\$ 1,314
Toronto	Standard code construction	53,946	\$ 3,033	\$ 1,807
	R-2000 home	38,000	\$ 1,581	\$ 1,177
Calgary	Standard code construction	77,229	\$ 5,126	\$ 1,805
	R-2000 home	55,300	\$ 2,662	\$ 1,245
Vancouver	Standard code construction	44,595	\$ 1,987	\$ 1,353
	R-2000 home	30,200	\$ 927	\$ 859

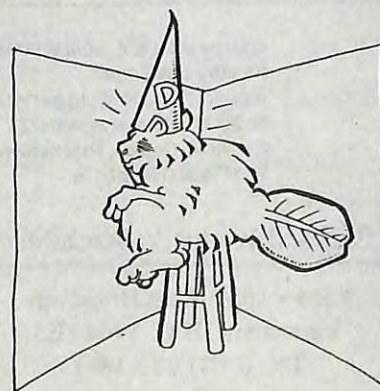
There is still a significant difference between standard construction practices and R-2000!

Think about how you buy gasoline for your vehicle. You pull up to the pump and see a single price per litre you will be charged. You are not presented with a list of so much for the truck driver that brought it to the gas station, so much for the property taxes on the station, so much for royalty payments, so much for the refinery, and so on. Yet that is how the "deregulated" gas and electricity rates in Alberta and Ontario are marketed. The utilities even have a manual on "how to read your bill." Fortunately, some utilities in the country still post a net price.

Of course, with the volatile energy market today, prices are going up and down significantly at short notice. Last winter's high gas prices seem to have moderated. However, it is a certainty that the long-term future trend is only in one direction, and that is up. Since we published the piece, Ontario electrical rates have increased because of another mandatory charge, this time a fee to pay for the costs caused by deregulation.

Because of the confusion caused by using incorrect figures, we are republishing the table using corrected energy pricing current as of early July 2001. These figures represent one house design, assumed to have been built to current local construction practices and to R-2000 standards. The specific house used is that of the test houses at the National Research Council's Centre for Housing Technology.

Remember that energy pricing seems to change almost weekly. The prices that appear in the table are an indication of the relative cost of different fuels and construction standards.



Practices for Sustainable Community Development

Sustainable development strategies are intended to reduce the impact of development on the environment. Sustainable development is an evolving field and has not been universally defined. Most Canadians understand that sustainable development may, in some way, benefit their world, their community, their families and themselves. However, the primary objective is to lessen the harm development does to its surroundings.

A sustainable community nurtures, protects and enhances its local environment through community stewardship. Sustainable urban development aims to create an environment that integrates and balances the basic social, economic and environmental needs of its residents. It addresses the local and global implications of development to ensure future generations' ability to maintain and renew a community where resources are conserved and sustainably managed.

Until recently there has been no guide to sustainable development written for Canadian conditions. *Practices for Sustainable Communities* is a recently published how-to guide that will help planners and developers. It provides an introduction to the social, economic and physical aspects of community development and sustainability. It is hoped that the guide will inspire innovative ideas for planning and building sustainable communities across the country.

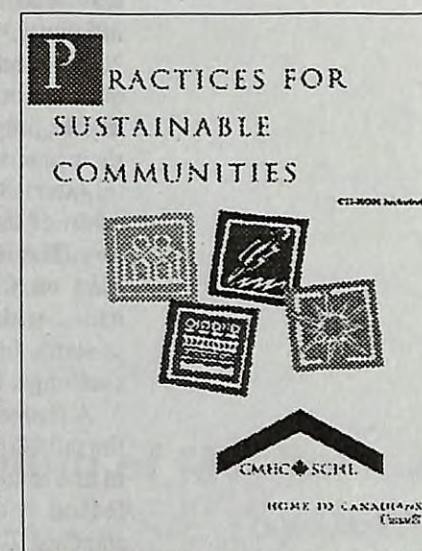
The physical aspect of development is the community's built and natural structures. This includes development patterns, the form and design of buildings, streets and infrastructure, and the protection and improvement of the natural environment.

Constructing any building always causes some ecological disruption. Modern buildings use much more energy and resources than they have at any time in the past. This disruption can be reduced dramatically through restraint and careful planning. Energy and resource efficient practices such as the R-2000 standard (or C-2000 standard for commercial and institutional buildings), are one way to reduce a building's impact.

Alternative approaches to housing development are also available and go a long way to reducing the detrimental impact a development can have on the environment.

Practices for Sustainable Communities is a well-illustrated, 176-page book that contains practical advice backed by case studies from many regions of Canada. The case studies give examples, definitions and descriptions of current sustainable development projects. The guide also focuses on other physical aspects such as natural water bodies, wood lots and fields, and storm water management and sewer systems.

The book also includes a CD-ROM containing the Sustainable Community Indicators Program (SCIP), a community environment indicator program developed by the CMHC and Environment Canada. The software helps communities measure and monitor their environmental health, resource consumption, settlement patterns, human well-being and employment, and commerce.



Practices for Sustainable Communities, \$ 59.95 is available from the CMHC
Tel. 800-668-2642
Fax 613-748-4069
www.cmhc-schl.gc.ca

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Quality construction?

"We're living in a city propped up with little more than match sticks. They are the only way the landlord can keep his tenants from falling out, as he plasters over the gaps in the cracks and tells them not to worry... (even if the place is about to fall around them!) It is wrong for people to have to live in fear of house fires and buildings collapsing all the time."

You think that was said by a disgruntled homeowner on the way to the lawyers' office? You think it is only recently that building standards have been questioned? This is a quote made by Juvenal, a Roman poet and satire writer who lived in the 1st Century AD.

Renewal of the R-2000 Program

Since the inception of the R-2000 Program, the way houses are built in Canada has changed significantly. We know that houses built to the R-2000 standard are inherently better than those built conventionally. Builders consistently identify the program as the single biggest influence on their practices.

After 18 years, the R-2000 Program is in the midst of the most major revitalization in its history. The Buildings Table of the National Action Plan on Climate Change recommended that a nation-wide target for R-2000 houses be set at 10% of starts. In the short term, this number may be a challenge, but it can be achieved over time.

A five-year funding commitment was made in the fall 2000 federal mini-budget. On the strength of the multi-year funding, commitment by the federal government, and a draft new technical standard, R-2000 builders have an unprecedented opportunity to broaden the market for the most energy-efficient, comfortable and reliable housing money can buy.

Recent meetings of R-2000 provincial managers and design professionals provided an opportunity to review operational issues and chart the future of program delivery. Top priorities for the immediate future will be strengthening training, the program's infrastructure and marketing.

Training

A renewed training initiative will be undertaken to deal with the proposed new technical standard. Training for all R-2000 participants - builders, design professionals, and quality assurance personnel will be made available by this fall. All R-2000 professionals will have to take update courses before the new technical standard becomes effective - if they do not, their licenses will expire. Inactive builders will be delisted, and a re-licensing process developed.

Master databases are being reviewed. NRCan will maintain a central database which will be online for easy access by provincial offices to ensure that up-to-date information about builders, plan evaluators, inspectors and air testers is available.

Technical Standard

The technical standard is central to the program. A draft of the revised standard is now available, with a hoped-for implementation in

April 2002. Test runs of the revised standard are being done this year to assess the impact new requirements may have on the industry. Of special interest will be an assessment of new mechanical system requirements. Depending on the outcome of this year's test runs, revisions may be made or implementation of some sections may be temporarily postponed.

A compliant materials and equipment list will also be made available through NRCan's R-2000 "Building Professional" site presently under development.

Refinements to quality assurance will include simple sign-off procedures but will maintain uniform national minimum requirements.

Marketing

R-2000 is a consumer program but—the key transaction is between the builder and the consumer. It is the builders who sell it to consumers. However, so far it has not worked well. As Barbara Mullally-Pauly, Chief of Residential Programs at NRCan said, "We have a great concept. We have the right builders, but we need more engagement by the industry. We have to get consumers more interested and ready to purchase the product. Energy prices are already pushing us in that direction. We want to work with builders to make sure they are engaged, getting more training, getting the houses registered, and ultimately, building better houses."

A new look will be taken at program marketing. The national marketing strategy being developed should play a key role in ensuring consistent program branding and messages. The program is being repositioned to focus on the message that any home can be built to the R-2000 standard. The key messages are that R-2000 is not exclusive, not hard to do, and pays you back in comfort, savings, and quality, while being the environmentally responsible choice. R-2000 will remain the "brand of choice" for housing, promoted as the highest quality energy-efficient homes available on the market today. Marketing materials will stress the message "If it's not certified, it's not R-2000!" and explain that a house built to code falls well below the requirements set by the R-2000 standard.

NRCan will develop marketing materials where the economies of scale are right, and will create a context in which provincial/territorial programs

can pursue their own campaigns and partnerships. For example, NRCan is presently investigating the possibility of developing a co-marketing mechanism that would permit manufacturers to label and market their products as "R-2000 compliant," though this would not imply certification or a stamp of approval.

It is anticipated that provincial offices will identify the specifics of their own target markets and, at a minimum, actively pursue standard low-cost public relations marketing practices to promote R-2000 locally. They will work with their builders and NRCan to determine achievable mar-

ket share targets, and develop and maintain partnerships with related programs such as PowerSmart. Cross promotion of common industry marketing programs like EnviroHome with R-2000 will become essential. Since every EnviroHome is, by definition, an R-2000 house, it is expected that future marketing for EnviroHomes will refer to them as "R-2000 EnviroHomes."

The goal of R-2000 marketing will be to increase awareness of the R-2000 standard and the value qualities of an R-2000 home in order to generate consumer demand for the product.

Commissioning of Mechanical Systems

One of the most common problems homeowners have with their home is discomfort caused by poorly performing mechanical systems. The emphasis on the lowest first price for the mechanical system often results in consumers paying for the discomfort through higher energy bills. Additional problems include excessive operating noise and uneven temperature distribution.

As so often happens, corners are cut and the completed mechanical installation falls short on performance, even though mechanical trades training includes correct design and installation procedures.

The performance of mechanical systems depends on the proper design, installation and commissioning of the system. Commissioning is the balancing of the completed system to ensure it works as designed.

Although the building code references standards for heating system design, many installed systems do not comply. In part, this happens because no authorities inspect or review the installed mechanical system. Such inspections as are done relate to specific aspects of trade safety. For example, the gas inspector will inspect for the proper gas hook-up and the electrical inspector may inspect correct wiring. If the heating system is hydronic, the plumbing inspector may look at the plumbing connections.

Because of its importance in maintaining of indoor air quality, the R-2000 program has always

required the verification of the ventilation system as part of the quality assurance process. However, no one really looks at the overall heating system. That is why the new R-2000 technical standards would like to test the requirement that all heating and cooling systems have to be commissioned, and this will have to be checked as part of the quality assurance procedures of the program. This has not been done in the past, and is a big step that will challenge many in the industry.

NRCan requested HRAI to develop a residential mechanical system commissioning course for R-2000 professionals. This training can be considered a supplement to heating system design courses. A test run of the course was done in June for senior R-2000 design professionals. This fall, the course will be made available to all mechanical trades and others interested.

Over the next year or so, the commissioning inspections will be done on a trial basis. This will give mechanical trades, builders and the R-2000 program the opportunity to assess the significance of this proposed change and the impact it may have on the industry. Mandatory commissioning inspections will become part of the R-2000 standard once it is clear that the industry can respond.



For information on the R-2000 Program, contact your local program office, or call

1-800-387-2000



Technical Research Committee News

Building Regulatory Reform in Ontario

The Ontario government plans to introduce legislation to change the building regulatory environment in Ontario. The proposed reforms to Ontario's building legislation are based largely on recommendations of the Building Regulatory Reform Advisory Group (BRRAG).

The proposed reforms are intended to "substantially cut red tape and streamline building code enforcement in Ontario." The reforms would be the most comprehensive and wide-ranging changes to the province's building regulatory system in more than 25 years. They mirror Australian regulatory changes, which also enable municipalities to outsource plans review and inspections to independent agencies along with the liability for the work done by those agencies, although the municipalities would have to ensure service availability.

Key elements of the legislation are expected to include:

1. That all participants in the industry would have to meet minimum qualifications. Key practitioners identified include building officials, inspectors/plan examiners, registered code agencies, design professionals (architects, engineers, and other designers), and residential and ICI builders/renovators. Qualifications would be based on the different classes of buildings covered by code and would be renewed with the code cycle. Qualifications would be verified through a registration system.

2. Key registration criteria would include: Code knowledge and insurance/warranty coverage. Stakeholder organizations and others are expected to be involved in the assessment of qualifications and the delivery of training. Broader responsibilities, including decisions about registration, may be given to bodies with regulatory authority (such as professional engineers, architects and the Ontario New Home Warranty Program).

The Ontario Ministry of Municipal Affairs and Housing would make decisions on issuing/renewing registrations except where those powers are delegated. The ministry would maintain lists of registrants and persons who have passed assessments and determine knowledge-based qualifications and insurance requirements.

Registration is not expected to extend to all individuals on a construction site but would stop at some "supervisory" level still to be determined. Municipalities would have a role in policing the registration scheme.

3. The legislated changes would also set out minimum service level standards for municipal code enforcement. This should mean standardized procedures such as number of inspections, and consistent forms such as common building permit application forms.

4. All building practitioners would be required to have adequate insurance/warranty for 10 years. This would allow more equitable distribution of liability within the current joint and several liability regime, reducing the impact of claims for building defects.

New HVI Fan Ratings

The Building Code requires that ventilation fans must meet capacity and sound rating performance according to the CSA-C260 standard. The only agency in North America that certifies air flow and sound ratings of ventilation fans is the Home Ventilation Institute (HVI). Until this year, the HVI ratings were compatible with those required by CSA-C260.

However, recent changes in the HVI testing methods have produced results that differ from the CSA standard. Fans conforming to the new requirements have new HVI labels. Although the fan designs have not changed, their ratings have been altered because of the revised sound test procedures. This has caused some confusion among builders and building officials, especially as keen marketers of some products have pressed the point, questioning the acceptability of equipment that seemingly does not comply with the code.

Recognizing that the changes are the result of altered procedures and not fundamental equipment changes, the Ontario Ministry of Municipal Affairs and Housing has issued a branch opinion. It states that based on past performance, equipment meeting the old standard (the 1999 HVI listing) may be used. A similar opinion was issued in BC.

The complete text of the Ontario Branch Opinion is available on their web site at: <http://obc.mah.gov.on.ca/opinions/part9/9-32-3-9.pdf>

The Technical Research Committee (TRC) is the industry's forum for the exchange of information on research and development in the housing sector.

Canadian Home Builders' Association,
Suite 500, 150 Laurier Ave. West, Ottawa, Ont. K1P 5J4
Tel: (613) 230-3060
Fax: (613) 232-8214
e-mail: chba@chba.ca

Code Revision Proposals

Stair Requirements

Proposals had been made to the National Building Code Standing Committee on Houses to increase the run and headroom for stairs. CHBA has been successful in encouraging the Committee not to adopt the changes, which would have meant significant redesign would have been required.

Exits from Basements

A new requirement for a second exit from basements in houses has been recommended for inclusion into the National Building Code. This

could require the use of a larger window to provide this exit. CHBA is asking for a detailed analysis for this potentially significant change. Should additional safety measures be required, other approaches to provide the safety should also be recognized in the code.

This proposal again emphasizes the point that basements are no longer residual storage space, but are finished living spaces and should be considered as such. As finished living space, to ensure the ability to maintain a high quality indoor environment, we should be paying more attention to the design, construction and finishing of basements.

House Demolition Reveals Early Use of Insulated Sheathing

So you think that air sealing, insulation and house wraps are recent innovations that may have contributed to construction moisture problems? You may be surprised to learn that these methods have been around for a long time. In fact, the widespread adoption and use of sheathing papers in North America came about as builders needed to make stick-built buildings more airtight and energy efficient, thus making them less drafty and more comfortable.

Today's focus on new approaches to conserving energy and the occasional failures in wood frame buildings have led to a rethinking of existing buildings. We need to find out if they are performing adequately or not, and why this may be so.

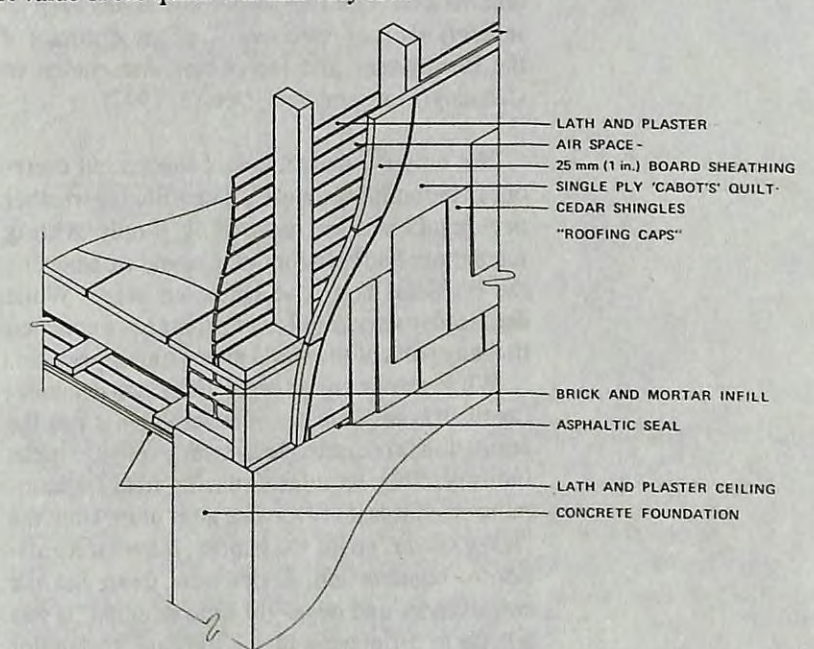
Insulated sheathings to reduce the space heating needs have been around for a long time. One insulating sheathing material used in eastern North America was Cabot's Quilt patented in 1915 and 1916. This was a flexible matt made of a thin layer of eel-grass (seaweed) between two layers of kraft paper stitched together. The quilt was applied horizontally, and fastened with large washers.

An example of the use of Cabot's Quilt was discovered during the demolition of a Halifax house built in 1923. The single ply quilt had been used behind the cedar shingles of the exterior walls. The sheathing boards and studs backing up the Cabot's Quilt were dry and sound.

As demolition continued, it became apparent that good design, careful selection of materials and quality workmanship had contributed to the air-

tightness of the envelope resulting in lower energy use.

The 5,000 square foot house had lower heating needs than other similar houses with full wall and ceiling insulation although the stud spaces were not insulated. Obviously, by today's standards the R-value of the quilts was still very low.



This construction detail was discovered in 1983, and was summarized in Building Research Note 211, by the Division of Building Research (now the Institute for Research in Construction).

Regulatory Reform: Do We Need New Regulations or Better Enforcement of Existing Rules?

Recent discussions about regulatory reform merit consideration about the intent of rules and regulations and how they are managed. Greg Lowes of the BC Wall and Ceiling Association passed on an interesting item relating to the illegal and questionable activity surrounding mining promotions.

The mining industry may seem a long way from housing, but the fundamental issue, which is common to both the financial market and the housing industry, is how regulations are administered. This is very relevant to the current situation being faced in BC today.

"... fear is growing among many in the mining business the report might end in the wrong thing: write new law when what is needed are more police. 'If they come up with strict technical controls, it will just kill the business' said Dale Hendriks, a Bre-X investor who raised the concerns about the company. 'They need more scrutiny of the people behind the public companies'... The problem is a lack of enforcement of the existing rules. 'They don't have to beef up the regulations, they should beef up the enforcement, and the OSC can't do so because it has been so severely short of resources.' (Tony Andrews of the Prospecting and Developers Association of Canada) (Financial Post, Dec 31, 1997)

Not only BC condominium owners but everyone in the building industry is questioning whether new regulations are required or, if only existing regulations had been followed, would we be seeing the problems that have happened here? While details may vary, similar situations have occurred in many parts of the world at one time or another.

While no one enjoys regulations, and denouncing them is easy, what is often forgotten is that the regulations are drafted because of screw-ups in the industry. They set a level playing field for minimum standards that everyone must meet. Until the "leaky condo" crisis, BC had, in , minimal regulation of construction. Codes were there, but the enforcement and oversight were nominal. It was left up to all players in the industry to monitor themselves. As we have sadly learned, not every-

one is a good guy. Many people will cut corners if they think they can get away with it - with horrendous consequences.

There are many ways to deal with regulations. The new provincial government in BC has set out to "reduce red tape." This raises questions how, or even if, existing let alone new or revised regulations can be adjusted or introduced. This is not an academic question.

At their annual meeting in April, BC architects approved bylaw changes allowing the profession to designate a speciality category for building envelope professionals (with special training requirements). Engineers have been working on similar changes to their regulations. However, at the last possible moment, the new government disallowed the architects' bylaw changes. On one hand, the government says it supports the "objective of improving building envelope design through some type of building envelope professional program," while on the other hand the message it is sending is that it wants to "reduce red tape and regulatory burden."

It is not at all clear how creating a specialist category within a profession, to address identified needs, adds to regulatory burden. BC architects were responding to the crisis of confidence not just in the profession but with the residential construction industry overall. As a self-governing professional body acting in the public interest, their move was taken with the public interest in mind, and according to appropriate legal counsel. It was done because, without a credible standard for practitioners, consumers had no way of determining who might have appropriate credentials.

Balcony Door Thresholds: Finding Accessibility Solutions

Water penetration at doors and windows is one of the biggest challenges designers and builders face. Achieving a water tight door sill is a particular challenge when barrier-free thresholds are required.

The design and construction of well-insulated thresholds is often neglected. Drainage away from the door area is also often poorly handled. That is why in apartments there is usually a 4 to 8 inch curb at the door. In houses, exterior decks are usually kept 4 inches or more lower than the floor. These types of doorways make passage for anyone with a disability or mobility problems difficult or impossible.

Although barrier-free design may seem to be a minor problem, it is a significant one. Twelve percent of the population of Canada, or about 3.7 million people, have some type of physical incapacity that limits their daily activities. The nature of the physical disability varies, but even the able-bodied can benefit from attention to full access. Even a one inch high threshold can be a tripping hazard. However, only about 120,000 apartment units are accessible or adaptable, and most of these are found in social housing or co-operatives.

Most single family dwellings are similarly inaccessible. The growing numbers of seniors in an ageing population means accessibility will become an increasingly significant issue.

Emphasis on barrier-free environments requires modification to design and construction methods. There are major technical challenges to obtaining sufficient air and water tightness and thermal insulation in barrier-free threshold design. Consumers, manufacturers and builders need to be aware that there may be cost-effective and adaptable accessibility solutions.

The need for accessible doorways to balconies and decks is especially important in multi-family dwellings because the National Building Code allows balconies to be used as fire refuges for people with physical incapacities. For balconies to serve this purpose, they must be fully accessible.

The design issues are complex and contradictory. Low thresholds for easy access, with not more than a 13 mm difference in level, are difficult to design so as to prevent the ingress of rain and the accumulation of water from snow melt.

Flat thresholds cannot resist the accumulation of water and often do not prevent air infiltration. Metal thresholds are conductive and allow con-

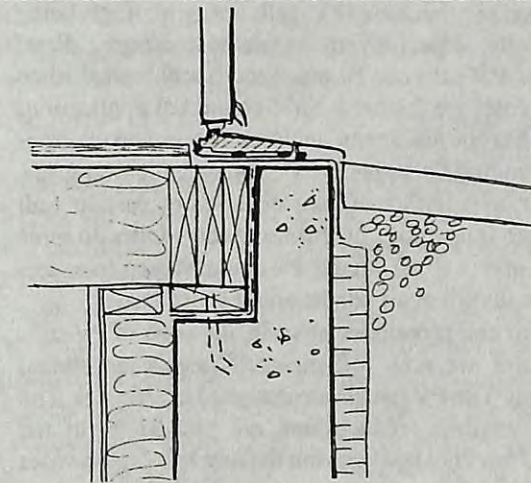
densation and frost to penetrate into the adjacent floor areas unless there is a good thermal break.

Overhead protection such as roofs and awnings can reduce exposure to weather. The orientation of the doors and the location of balconies and terraces relative to prevailing and storm winds will also influence how little or how much rain and snow can fall on these elements and what sort of problem this will be. If allowance is not made for drifting snow, then even a protected doorway could be full of snow.

The treatment of thermal bridges, as well as the removal and drainage of melt and rain water also need to be considered.

Issues that need to be considered when designing barrier-free thresholds include:

- water runoff
- elimination of thermal bridging
- maximum threshold slope of 1:6 for a difference in level of not more than 13 mm to 25 mm
- a drip mould at the bottom of all hinged doors
- possibility of adding an inclined plane on the interior side of the threshold?



One detail for proving an accessible entrance door. The exterior paving is sloped 2% outward, and brought up level with the interior floor. The foundation wall is brought up to top of wall framing. The door should have a roof canopy to provide protection. Air barrier continuity is maintained by wrapping floor joists with housewrap. A self adhesive rubberized membrane placed under the door frame and onto face of foundation wall prevents standing water of snow seeping under to door frame into the interior. Non frost susceptible granular fill is used below the paving to prevent lifting of paving by frost.

This detail is adapted from CMHC's Best Practice Guide: Wood Frame Envelopes.

Marketing Ideas

It may come as a surprise, but despite the high natural gas prices the industry is aggressively promoting the use of gas. One western gas utility is encouraging their dealers to promote patio heaters, lamps, pool heaters and outdoor fireplaces. The message they suggest dealers should push is that the outdoor heaters and fireplaces will make early and late season cookouts more comfortable. They say the focus should be put on selling the experience and the fun of barbecuing and backyard living. In other words, "sell the experience and not just the product!"

Now let's see. If it is so much fun, and we need all the creature comforts outdoors, why do we bother to seal and insulate our houses? Maybe we

should not bother installing windows - just finish the openings nicely and install a nice wrought iron grill for security. Wouldn't that bring the outdoor experience indoors year round?

Just a thought.

On the other hand, there is a lesson here for builders. Few home buyers get turned on talking about insulation levels, high efficiency furnaces or the qualities of argon compared with krypton in windows. On the other hand, superior indoor air quality, improved comfort, quality and lifestyle are another thing. So rather than just selling energy efficiency, we should emphasize better value and quality.

Solar Roofs

Photovoltaic cells (cells that generate electricity directly from the sun) were developed for the space program to provide power for satellites. Today, this technology is widely used in small consumer electronics, such as solar watches and calculators.

Although still expensive, photovoltaic (PV) cells are increasingly being used to generate electricity, especially to supplement off-grid diesel generators. In some areas, PV cells can be much more economical when servicing and reliability costs are factored. Grid-connected applications are starting to appear. In Europe and Japan, national energy and environmental policies are encouraging the use of PV to supplement power grids. Building integrated solar cells, either as roof mounted or curtain wall panels, are being used more frequently, and bringing costs down. In some areas of the United States and central Canada, PV could be used economically to supply summer loads when air conditioning usage peaks.

With greater production and economies of scale, the costs of PV cells are falling. Solar roof tiles are now "off-the-shelf" items, as several companies now make them. The PV panels are designed as shingles. The shingles replace regular roofing products and are hooked up to the electrical system. The roof does not just keep out the rain but also provides electricity.

One Japanese company has gone a step further and combined the PV modules with a solar water heating panel. A shingle not only generates electricity but also preheats domestic hot water. The overall system efficiency increases because at the high temperatures a roof can receive on a warm day, the efficiency of PV cells drops. The water heater element removes heat, thus cooling the PV cells.

One of the larger home builders in Japan now offers this product as a regular option for their customers. The solar option is not just a throw-away marketing gimmick, but is backed by glossy, 16-page promotional solar system guide.

How to Get Results From Your Advertising

Ever wonder how to make your marketing message effective? Focussing on products and technology, which we tend to do, does not generate much interest. A recent article on marketing in the Gas Journal had some interesting findings.

Appealing to the emotional impact of the product on the customer generates 45% more inquiries than a purely rational, technical appeal.

Personal testimonials from existing customers accompanied by photographs sells six times as much as impersonal signed references.

A positive, direct approach can produce 30% more sales than the negative approach.

Something that even marketing people forget is the importance of making advertising credible and easy to read. This is more important than brilliant graphic design, fancy copy, and a work of art by a super photographer.

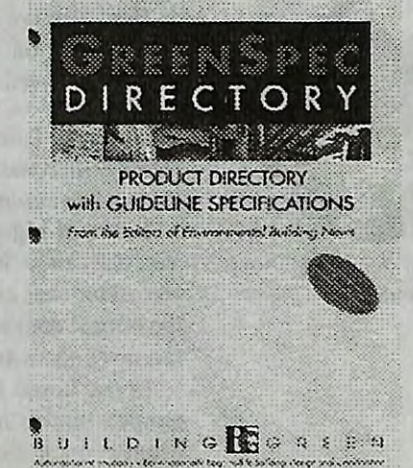
To get advertising noticed it must be run repeatedly. This explains why you often see commercials on TV repeated so often. The 3rd time an ad is run, 5% of the audience will recall it. This increases to 22% after the 30th ad, and 35% after the 47th.

GreenSpec™ Guide to Building Products

The publishers of Environmental Building News have just issued the second edition of the GreenSpec Directory. This 362-page guide includes detailed information on more than 1,500 screened products, from access flooring to zero-VOC paint. Listed products are selected based on standards developed by EBN editors. All entries are organized in the standard 16-division construction specification format.

The directory, is available either alone or packaged in the GreenSpec Binder with manufacturers' product literature. It also contains generic specification language that can be used for drafting specifications.

This is a US based source document but it is one of the most comprehensive green product resources available. In today's trading environment many products may also be available in Canada. This document will also be of value to Canadian builders and designers.



The GreenSpec Directory is US \$79 plus shipping. The Green Spec Binder (including the directory and manufacturers' literature in a 3-ring binder) is US \$99 plus shipping.

For information phone: 800-861-0954

Fax: 802-257-7304.

E-mail: infor@GreenSpec.com or visit www.GreenSpec.com on the Internet

What makes a product green?

The field of "green" building products is evolving fast with few universally accepted criteria. The editors of Environmental Building News identified quantifiable, easily verifiable, standards where these exist. For many criteria judgment calls were required. Often, a product may be considered green for more than one reason. The criteria for selecting products included the following elements:

Products made from environmentally attractive materials: salvaged products; products with post-consumer recycled content; products with post-industrial recycled content; certified wood products; rapidly renewable products; products made from agricultural waste material; or minimally processed products

Products that are green because of what isn't there: products that reduce material use; use alternatives to ozone-depleting substances; alternatives to products made from PVC and polycarbonate; alternatives to conventional preservative-treated wood; or alternatives to other components considered hazardous.

Products that reduce environmental impacts during construction, renovation, or demolition.

Products that reduce environmental impacts of building operation: building components that reduce heating and cooling loads; equipment that conserves energy; renewable energy and fuel cell equipment; fixtures and equipment that conserves water; products with exceptional durability or low maintenance requirements; products that prevent pollution or reduce waste; or products that reduce or eliminate pesticide treatments.

Products that contribute to a safe, healthy indoor environment: that don't release significant pollutants into the building; products that block the introduction, development, or spread of indoor contaminants; that remove indoor pollutants; products that warn occupants of health hazards in the building; or products that improve light quality.

Energy Answers



Rob Dumont

Are there any low cost energy measures that could be used to tuneup an already efficient house such as an R-2000 house?

Here are five low cost/no-cost measures. You won't retire on the savings, but a petajoule (or gigajoule) saved is a petajoule earned.

1. If your house has a heat recovery ventilator (HRV), disconnect the power to the supply fan during the summer months.

I do that regularly on our house, which has a Van EE 2000 Plus unit. There is an internal connector that can be easily accessed by opening the hinged door to the unit. Turning off the supply fan saves about 40 watts. If you do this, do it safely!

In our house in Saskatoon, where the average temperature in July is 17°C (63 °F), a window is usually open throughout the summer, and by disconnecting the supply fan during the summer we save about \$10 a year. Disconnecting the supply fan is also a good time to clean the filters on the unit.

This technique is not recommended for climates where air conditioning is needed during the summer months.

Materials cost \$0 Annual saving \$10

I could save even more energy by turning off the heat exchanger completely in the summer time, but we have several bathrooms without windows, and... well, you get the point.

2. Super-insulate your water heater.

Most water heaters have only an inch or two of glass fibre insulation. I added 6 inches (150 mm) of glass fibre batts to the outside of the unit, and covered the batts with foil backed insulation. This dropped the standby heat loss from 100 watts to 25 watts on an electric water heater. I also added insulation to the inlet and outlet piping for the water heater. Although the heat lost from the water heater helps heat the house in the heating season, the losses add to the cooling load in the summer months.

Materials cost \$50 Annual savings \$18

Remember that this applies to electric water heaters. Gas heaters can be insulated, but care must be taken not to block the combustion air inlet.

3. Super-insulate the air ducts leading from the HRV to the outside wall of the house.

Most insulated ducts have only about one inch (25 mm) of insulation. The ducts are equivalent to an outside wall of the house but have only R4 wall insulation (the rest of your walls have at least R20). The HRV in our house has about 20 feet of insulated 7-inch diameter ducting for a surface area of 36 square feet. On an annual basis, the ducts lose about 2.5 million Btu of heat - at our local electricity price the cost of the duct losses is about \$60 per year. Increasing the duct insulation to R16 would cut that cost to \$45 a year. It is very important to have an excellent vapour barrier on the outside of the extra insulation to prevent moisture migration and condensation in the insulation. The extra weight of the duct insulation will usually require additional supports.

Materials cost \$50 Annual savings \$45

4. Tune up the incandescent lighting in your house.

The IKEA chain is now offering compact fluorescent lamps (CFLs) at \$7.50 plus taxes, and Home Depot recently had a special at \$7.98 plus taxes. These lamps are rated for 10,000 hours, compared with 1,000 hours for conventional incandescent lamps. A typical house can save about 2/3 on the lighting portion of the electricity bill by switching to CFLs. A saving of 800 kilowatt-hours per year would amount to \$66 per year at 8.25¢/watt. (Realistically, however, the annual saving would be about 1/4 to 2/3 that amount, because the heat from the incandescent lamps is useful for space heating in the heating season and has to be replaced by heat from a furnace or other heating system). The cost of replacing 20 CFL lamps would be about \$170.

A side benefit of the CFLs is reduced heat generation in the house in the summer. Another benefit is the improved global environment. A 20 watt CFL that replaces a 75 watt incandescent lamp would save about 500 pounds of coal over the lifetime of the lamp in those locations where coal fired generation is the primary electricity supply.

Materials Cost \$170 Annual Savings \$17-\$44

5. Reset the ventilation rate on your air-to-air heat exchanger.

Over time the ventilation flows through your HRV will change from their proper setting due to

dirty filters, fan blade dirt accumulation, altered damper settings, etc. At worst, one of your fan motors may have failed without your knowing it, and your heat exchanger effectiveness may have fallen to zero.

Cleaning the filters, heat exchanger core, and fan blades, and oiling the motors to the manufacturer's specifications can all help with the tune-up. It is also important to ensure that proper airflow settings are being maintained.

In the July 1995 issue of Solplan Review, Don Fugler of CMHC wrote an excellent article on "Measuring Airflows: The Garbage Bag Test." The article describes an inexpensive technique for building an airflow measuring device. An informed do-it-yourselfer can readily make the flow measuring device and check the air flows on the air exchanger.

These five measures can all make a measurable difference in your energy bills. Take five!

Re: Mould and Indoor Health, and Letters to the Editor (Solplan Review No. 98, May 2001)

I was pleased to see your very timely article on mould and indoor health, but I would like to make one suggestion for future consideration. Moulds are a specific group of fungi and the two words should not be used interchangeably as some might infer from the first sentence of the article. Mushrooms are fungi too, but you would not get many takers if you invited people round for mould risotto.

On a related subject, the air barriers now to be required between garages and the remainder of the building (Letters to the Editor, No 98 May 2001) may have an additional benefit in reducing mould growth due to condensation from moist air entering the garage from the building. This is a problem that has occasionally cropped up over the past few years in the Vancouver area.

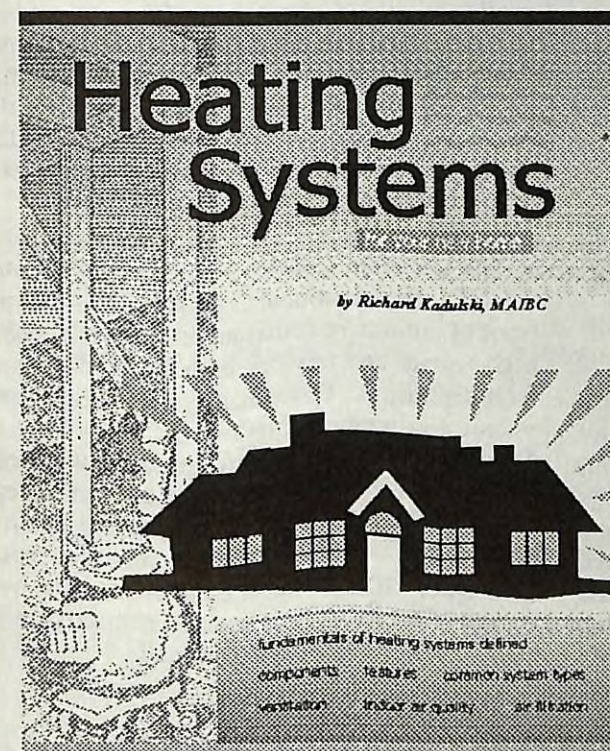
Keep up the good work.

Paul Morris
Forintek Canada Corp.
Vancouver, BC

Thanks for the comment. Many sources seem to use the terminology "mould" and "fungi" interchangeably. I take it that you would be suspicious if offered risotto ai funghi for dinner? Ed.



Letter to the Editor



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by Richard Kadulski, MAIBC

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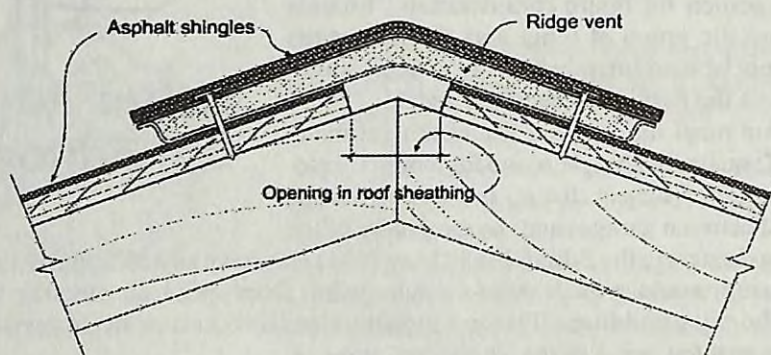
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CCMC evaluation of the effectiveness of ridge vents



Homeowners have often wondered about the effectiveness of ridge vents on their roofs. Ridge vents, in combination with eave vents, are intended to provide natural ventilation to the roof space between the insulation and the underside of the roof sheathing of pitched roofs.

The Canadian Construction Materials Centre (CCMC) of the National Research Council's Institute for Research in Construction has recently completed an evaluation of three new ridge vent products made of either three-dimensional polymeric matting or molded plastic. In its evaluation, CCMC determined the effective venting area of each product, and also assessed the product's ability to

- sustain loads imposed by wind
- prevent rain water entry
- resist traffic loads during installation or roof maintenance.

Evaluation approach

The air flow characteristics of the ridge vent assembly were assessed to determine the effective venting area of the product as installed. This approach was chosen because the vent openings for this type of product are relatively small and their effective size cannot be readily measured using standard measurement techniques. In order to establish equivalency to the roof space venting requirements of the National Building Code 1995 (NBC), Sentence 9.19.1.2.(6), the effective venting area of the ridge vent must be determined.

This article was reproduced from the spring 2001 edition of Construction Innovation, the quarterly newsletter of the National Research Council's Institute for Research in Construction. To access the complete newsletter, visit www.nrc.ca/irc/newsletter/toc.html

NRC-CMRC

The effective venting area of each product is established, along with some limitations on usage, in the CCMC evaluation reports. It is based on a specific size of openings in the roof sheathing at the ridge. The reports stipulate that the lateral braces of the trusses must not obstruct these openings. Other limiting conditions stipulated in the reports include:

- Ridge vents must be stopped at least 150 mm from the end of the ridge.
- Ridge vents must be installed in conjunction with eave intake vents that are designed to provide 55% of the total combined unobstructed venting area.
- Sufficient vents must be installed to provide an unobstructed vented area for the roof that is 1/300 of the insulated ceiling area, as required by the NBC. Given the limited venting area provided by the ridge vents, additional roof vents may be required to comply with this requirement.

Evaluation findings

The evaluation demonstrated that the effective venting area varies significantly from one product to another and can be as low as 0.0045 m² per linear metre or as high as 0.032 — nearly 10 times as large. In general, the more open the product, the better its venting performance. However, the openness of a product must be weighed against its other physical properties and its durability.

The Canadian Construction Materials Centre (CCMC) offers a national evaluation service for all types of innovative construction materials, products, systems and services, both for buildings and for infrastructure. Based on the latest research and technical criteria, evaluations are carried out to determine whether innovative products will meet the intent of building codes and perform as expected by the manufacturer. Evaluation reports, such as those mentioned here, are published in the CCMC Registry of Product Evaluations. The web version of the Registry is updated quarterly while a print version is published annually.

The CCMC Evaluation Reports (Nos. 12523-R, 12961-R and 13000-R) for the three ridge vents can be obtained by contacting CCMC directly or by visiting the web site at www.nrc.ca/ccmc. Specific questions can be directed to evaluation officer Gilles Poirier at (613) 993-6623, fax (613) 952-0268, or e-mail gilles.poirier@nrc.ca.

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27th Annual Conference of the Solar Energy Society of Canada
Regina, SK
Tel: 306-791-7945
www.solarenergysociety.ca

October 24-27, 2001

EEBA Conference
Orlando, Florida
Tel: 952-881-1098
Fax: 952-881-3048
www.eeba.org

September 10, 2001

Workshop on Photovoltaic Hybrid Systems
Montreal
<http://pv-horizon.nrcan.gc.ca>

February 24-27, 2002

CHBA Annual Conference
Victoria, BC
Tel: 905-954-0730
Fax: 905-954-0732

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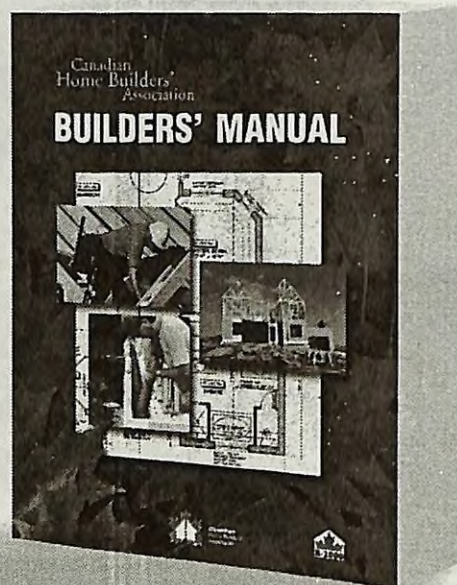
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